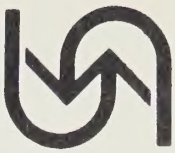
FILMSTRIP MANUAL

THAT'S AN IDEA

NATIONAL DESIGN BRANCH
DEPARTMENT OF INDUSTRY
OTTAWA, CANADA



THAT'S AN IDEA

CONTENTS

INTRODUCTION

This filmstrip is one of several intended to assist the National Design Council in creating a greater awareness of the importance of 'design in industry'.

In this particular filmstrip the emphasis is on the role of design in the development of a new product. The filmstrip uses as its example of design innovation, the case history of the Sport-Vac, a small, highly portable vacuum cleaner that operates off a car lighter or other 12 volt source. Throughout the filmstrip attention is given to the interrelated contribution of the manufacturer, the research engineer and the industrial designer.

The filmstrip commences by introducing the ingredients necessary for the origination of any new design product—IMAGINATION plus KNOWHOW. It then illustrates the origination of the Sport-Vac idea. This is followed by the step-by-step development of the product—*evaluation of the need;* analysis of the product; *what are the problem parts?;* the contribution of the research engineer in *designing a highly efficient impeller* and the work of the industrial designer in *making the product manufacturable and appealing.*

The filmstrip ends with a short review of the Sport-Vac's design features.

THE PRINCIPAL PEOPLE AND COMPANIES INVOLVED:

THE MANUFACTURER:

R. Donald J. Griffiths, President, Car-Vac Industries Limited

Formal education includes university courses in marketing, business administration and law. Prior to setting up his company, Car-Vac Industries Limited, in 1962, R. D. J. Griffiths worked in the field of insurance and pharmaceuticals.

THE RESEARCH ENGINEER:

Henry Zitko, Mechanical Engineer, British Columbia Research Council.

Employment experience includes work with Westinghouse in the field of electrical and aerodynamic engineering. Aptitudes include the manual dexterity and visualizing ability of an artist-craftsman.

THE INDUSTRIAL DESIGNER:

Lawrie G. McIntosh, McIntosh Design Associates.

In addition to his formal training as a mechanical engineer he obtained an M.S. in Product Design at the Illinois Institute of Technology (NIDC scholarship) and attended a two week seminar in creative engineering at MIT (NIDC Grant). Has received several national and international product design awards.

THE STORY OF THE SPORT-VAC AS TOLD BY THE MANUFACTURER

It all started three years ago (1961) when Donald Griffiths, a young Vancouver businessman, decided there was a market for a small portable vacuum cleaner for cars, boats, trailers and tents—one that would work from an automobile cigarette lighter or other 12 volt DC source without sacrificing pickup power.
Although several engineers advised him it was not possible, Griffiths took his problem to the *British Columbia Research Council.* It was handed to engineer *Henry Zitko* in *December 1961.* In one month he had a rough working model. In another five months he had produced the basic machine.

Despite its small size, light (5 lbs.) construction, the machine has powerful suction and can lift heavy gravel and dirt—even a half-dollar cannot escape. The secret of Sport-Vac's higher performance is the impeller and, despite its size, it is capable of moving large quantities of air.

By the use of a simple attachment called "Mattress Master", the exhausted air is utilized for inflating air mattresses, rubber rafts, etc. Mattress Master will inflate the average air mattress in less than 60 seconds and is more efficient than any inflater currently on the market.

If no lighter socket is available, the machine can be clipped to the terminals of an ordinary 12 volt battery.

Apart from the basic research which was done by the British Columbia Research Council, the entire operation has been a product of the Province of Ontario.

With the working parts of the machine in order, Car-VAC Industries Ltd. commissioned a leading *Canadian designer, Lawrie McIntosh of Toronto*, to design the machine for production. He decided on an all plastic construction for light weight, and chose ABS (acrylonitrile-butadiene-styrene) for its toughness, ability to withstand abrasion and other rough treatment to be expected in application, and for its good quality appearance. Production was to be by injection moulding.

Designs were completed on January 21, 1963. From these blueprints five mock up *models were created by Composite Forms, Toronto* and from these a market test was conducted. As soon as we were satisfied that a large potential market existed, die making started almost immediately at the *Accurate Mould Co. Ltd., Toronto* on the injection and mould tools. So speedy and competent were the mould-makers that production tests were being carried out by the first week in May.

The moulding contract went to fast growing *Sterling Plastic Manufacturing Co., Ltd., in Toronto*. This company also assembled the whole machine and packaged the completed product ready for delivery to retail outlets.

Other Ontario firms contributing to the complete assembly of the machine are as follows:

Motors	by	*Controls Company Canada Ltd.* St. Thomas, Ontario
Hoses	by	*Dayton Rubber Company,* Toronto, Ontario

Cords	by	*Fleck Company,* Toronto, Ontario
Cartons	by	*Hinde Dauche,* Ontario

SOME COMMENTS ON THE DEVELOPMENT PROBLEMS BY THE RESEARCH ENGINEER

"Three motors were used in developing a working model. The last of these were not tried until the second working model was completed".

"We were faced with a limited supply of power and an unknown requirement—adequate suction. The latter was found by testing many large and small cleaning units. A new impeller had to be developed to match the unusual performance and the small power source of 12 volts. Several impellers were fabricated and tested. The first requirement of these impellers centered on performance and secondly on ease of production".

"The six months taken for impeller development was largely filled with the making of the first and second working models. The first working model was made with the motor and impeller axis horizontal. The change in the axis to the vertical on the second model was an obvious improvement for production".

SOME OF THE DESIGN PROBLEMS FACED BY THE INDUSTRIAL DESIGNER

Industrial design involves reconciling the competing disciplines of *manufacture, function* and *marketing*.

MANUFACTURE

If the working model was to be manufactured as it was, with a large exterior handle, the top half would have to be manufactured in two parts and then joined together. This would not only leave a ridge along the back of the handle but would add to the manufacturing costs. By designing a snap-in handle this problem was eliminated. Manufacturing costs were also cut by incorporating piano hinges as part of the moulded housing.

FUNCTION

No attempt had been made to solve the problem of component stowage in the working model. The designing of a suitable interior housing was necessary to improve ease of storage.

MARKETING

Product sales appeal is an important contribution of the industrial designer. More attractive components, an improved interior and the use of surface texture in the exterior housing, all added to the sales appeal.

A FEW OF THE COSTS AND SPECIFICATIONS

Cost of development and designing prior to machine manufacturing	$ 70,000
Industrial designer's fee	$ 5,000
Total costs to date (May 1964) including machine development and marketing	$225,000
Retail market price of the Sport-Vac	under $30
Weight	5 lbs.
Dimensions	15" x 9" x 5½"

Material: ABS plastic (acrylonitrile—butadiene—styrene)

A BRIEF CHRONOLOGY

1961—Idea for Sport-Vac conceived by Donald Griffiths.

1961 (Dec.)—Development problems taken to British Columbia Research Council.

1962 (June)—Completion of two working models by Henry Zitko of the British Columbia Research Council.

1962 (June)—Car-Vac Industries Limited incorporated.

Working models turned over to McIntosh Design Associates, Toronto, to design production prototype.

1963 (Jan.)—Drawings for the production prototype completed.

Five mock-up models made by Composite Form, Toronto.

Market testing with mock-up models.

Die making begun by Accurate Mould Co. Ltd., Toronto.

1963 (May)—First production tests.

Moulding contract given to Sterling Plastic Manufacturing Co. Ltd.

First production run of 2500 machines.

1963-64—Introduction of the Sport-Vac to national and international markets.

FILMSTRIP CAPTIONS AND COMMENTS

1. THE NATIONAL DESIGN COUNCIL OF CANADA

   presents

   (Plain background)

2. THAT'S AN IDEA:

   A Case Study in Design Innovation

   An outline of the filmstrip's intention and contents:—
   This filmstrip is one of several intended to assist the National Design Council in creating a greater awareness of the importance of 'design in industry'.
   In this particular filmstrip the emphasis is on the role of design in the development of a new product. The filmstrip uses as its example of design innovation, the case history of the Sport-Vac, a small, highly portable vacuum cleaner that operates off a car lighter or other 12 volt source.
   Throughout the filmstrip attention is given to the interrelated contribution of the manufacturer, the research engineer and the industrial designer.
   The filmstrip commences by introducing the ingredients necessary for the origination of any new design product—IMAGINATION plus KNOWHOW. It then illustrates the origination of the Sport-Vac idea. This is followed by the step-by-step development of the product—*evaluation of the need;* analysis of the product; *what are the problem parts?;* the contribution of the research engineer in *designing a highly efficient impeller* and the work of the industrial designer in *making the product manufacturable and appealing.*
   The filmstrip ends with short review of the Sport-Vac's design features.

   (Title over photograph of a Sport-Vac, with hose attached)

3. IMAGINATION+KNOWHOW=A NEW PRODUCT

   The ingredients required to produce a new product
   (Plain background)

4. (No caption)

   (How a hand beater+electricity=a power beater;
   and how a scythe+motive power=a power mower)

   (Cartoon)

5. "ISN'T THERE A BETTER WAY?"

   The difficulty in cleaning a car with a vacuum cleaner designed for cleaning a house. The idea for the Sport-Vac is said to have occurred to Donald Griffiths, the manufacturer, when he was having difficulties cleaning his own car with a house vacuum cleaner.

   (Cartoon)

6. "WHY NOT RUN THE VACUUM OFF THE CAR BATTERY?"

   The first step in the thinking that led to the Sport-Vac. The vacuum cord is clipped to the battery.

   (Cartoon)

7. "WHY NOT A SPECIALLY DESIGNED VACUUM PLUGGED INTO THE CIGARETTE LIGHTER?"

   The completed idea—A small portable vacuum taking its power from the cigarette lighter.

   (Cartoon)

8. (Text frame)

   "HOW MANY WOULD BUY IT?"
   "HOW MUCH WOULD THEY PAY FOR IT?"

   Griffiths' answer to "How many would buy it?"
   —There are 80 million cars in North America today.
   50 million of these cars, built after 1956, all have 12 volt batteries and most of them have lighters.
   The selling price of under $30 was felt to be within reach of the average car owner.

   (Cartoon)

9. (Text frame)

   ANALYSE THE PROBLEM

   HOW ABOUT:

   BATTERY DRAIN
   ADEQUATE SUCTION
   EASE OF HANDLING AND STORAGE
   MANUFACTURING COSTS

   (Plain background)

10. (Text frame)

PARTS OF A VACUUM CLEANER
SUCTION INTAKE
AIR IMPELLER (FAN)
MOTOR
DUST BAG
HOUSING

The parts fundamental to any vacuum cleaner.

(Cartoon)

11. (Text frame)

POSSIBLE ARRANGEMENT OF PARTS

- HOUSING—COMPACT, DURABLE, LIGHTWEIGHT
- MOTOR—SMALL, HIGH POWERED
- IMPELLER—HIGH YIELD, LOW BATTERY DRAIN
- DUST BAG

A possible *compact* arrangement of vacuum cleaner parts and the air flow path. In this frame, the three problem parts are given emphasis—the *impeller,* the *housing* and the *motor.* It should be noted that in the first working model developed by the research engineer the motor-impeller axis was horizontal. In the second working model it was decided to change this axis to the vertical.

(Cartoon)

12. (Text frame)

HOW WERE THE PROBLEMS SOLVED?

(Plain background)

13. THREE MOTORS WERE TESTED FOR SUITABILITY.

Three motors were used in developing a working model. The last of these motors was not tried until the second working model was completed. The motor used in the Sport-Vac is made by Controls Company Canada Limited—St. Thomas, Ontario.

(Photograph—close view of the motor)

14. DEVELOPING AN EFFICIENT IMPELLER WAS CLEARLY A RESEARCH JOB.

The problem of developing a working model was given to the British Columbia Research Council in Vancouver. The job of developing the required impeller was the major problem to be solved. Henry Zitko, the mechanical engineer assigned to the job, outlined the problem as follows:

> "We were faced with a limited supply of power and an unknown requirement—adequate suction. The latter was found by testing many large and small cleaning units. A new impeller had to be developed to match the unusual performance and the small power source of 12 volts. Several impellers were fabricated and tested. The first requirement of these impellers centered on performance and secondly on ease of production".

(Photo—Henry Zitko working on the development of the impeller)

15. SEVERAL IMPELLERS WERE FABRICATED AND TESTED.

(Photo—Henry Zitko and the various impellers that were tested. In his hand is the final impeller—he is establishing the relationship between the impeller and the scroll case)

16. PRODUCTION OF TWO WORKING MODELS, INCLUDING IMPELLER DEVELOPMENT AND MOTOR TESTING TOOK SIX MONTHS.

"The six months taken for impeller development were largely filled with the making of the first and second working models. The first working model was made with the impeller axis horizontal. The change in the axis to the vertical on the second model was an obvious improvement for production". H. Zitko.

(Photo of the second working model [Open and closed] produced by Henry Zitko)

17. (Text frame)

THE WORKING MODEL WAS HANDED OVER TO AN INDUSTRIAL DESIGNER TO DEVELOP A PRODUCTION PROTOTYPE.

The industrial designer was Lawrie G. McIntosh of McIntosh Design Associates, Toronto.
Industrial design involves reconciling the competing disciplines of *manufacture, function* and *marketing*.

(Plain background)

18. (Text frame)

THE DESIGNER AIMED AT A PRODUCT THAT WOULD PROVIDE:

PERFORMANCE EFFICIENCY

CONVENIENCE IN USE

ECONOMY OF PRODUCTION

(Photo—Lawrie McIntosh examining the working model)

19. DESIGNING WAS FROM THE INSIDE OUT, STARTING WITH THE IMPELLER AND MOTOR.

(Photo—the motor and impeller. The yellow line around the motor and impeller suggests the outline of a housing)

20. THE SCROLL CASE HAD BEEN ESTABLISHED BY THE RESEARCH COUNCIL.

The function of the case and impeller are interdependent. The efficiency of their design depended on Zitko's knowledge of aerodynamics.
(Artwork—to the left, a *plan view* of the scroll case and motor in the *working model;* to the right, an *elevation* of the *prototype* showing the *motor and the impeller*, with the impeller housed in its scroll case)

21. HOUSINGS AND ATTACHMENTS WERE DESIGNED FOR MANUFACTURE BY INJECTION MOULDING.

For the product to succeed, it should be light in weight and low in cost. Since the durability required of the machine was quite high, but not comparable to that of industrial equipment, and since appearance was important, but not as important as in a piece of furniture, it was possible by using injection moulding of plastic for the housings (and attachments) to produce a vacuum cleaner that would meet both of the

specified requirements—*lightweight—low cost* and still maintain good durability and appearance.

(Photo—the foreman at Sterling Plastic Manufacturing Company Ltd., Toronto, examining the top half of the housing. In the background is the machine for injection moulding)

22. FIVE PROTOTYPES WERE BUILT FOR ADVANCE SALES ACTIVITIES.

    Before going into the large expenses involved in machine production, five mock-up models of the production prototype were made by Composite Form, Toronto, from McIntosh's drawings. (These were used by the manufacturer to make a thorough evaluation of the potential market).

    (Photo—Griffiths and his associates examining Sport-Vac prototype)

23. MOTOR POSITION DEPENDED ON A MANUFACTURABLE HANDLE AND GOOD WEIGHT DISTRIBUTION.

    McIntosh's first job was to design a manufacturable housing. If the working model was to be manufactured as it was, with a large exterior handle, the top half would have to be manufactured in two parts and then joined together. This would not only leave a ridge along the back of the handle but would add to the manufacturing costs.

    (Photo—working model—handle-motor relationship)

24. BY USING A RECESSED SNAP-IN HANDLE, THE HANDLE AND HOUSING BECAME EASY TO MANUFACTURE.

    (Photo—prototype—snap-in handle)

25. THE HANDLE RECESS REQUIRED MOVING THE MOTOR TO THE REAR.

    (Photo—shift in motor position)

26. (Text frame)

    1. MOULDED HINGE AS PART OF THE HOUSING
    2. CAPTIVE NUT OVER THE HOSE CONNECTION AS A CLOSURE DEVICE.

    (Photo—prototype)

27. (Text frame)

    3. CORD CONNECTION MOVED INTO LINE WITH INFLATOR OUTLET

    4. A BONUS—A CONNECTION FOR A MATTRESS INFLATOR

    (Photo—working model to the left, prototype to the right; also old and new mattress master)

28. MATERIAL—ROUGH TEXTURED ABS PLASTIC FOR DURABILITY, EASY MAINTENANCE.

    McIntosh chose ABS plastic (Acrylonitrile—butadiene—styrene) for its toughness, ability to withstand abrasion and other rough treatment to be expected in application, and for its good quality appearance.

    (Photo—close view of the finished prototype housing)

29. (Text frame)

    INTERIOR HOUSING

    FUNCTION: PROTECTION OF MOTOR
    TIDY STORAGE OF PARTS

    CONDITIONING FACTORS:

    MOTOR POSITION
    MOTOR COOLING
    HANDLE RECESS
    NUMBER AND SHAPE OF PARTS

    No attempt had been made to solve the problem of component stowage in the working model. The designing of a suitable interior housing was necessary to improve ease of storage, and therefore ease of use.

    (Photo—lower half of the prototype exterior housing with the motor installed: the components—hose, nozzles [two], cord and Mattress Master that must be stored within the housing)

30. (No Caption)

    (Photo—interior housing [only])

    Artwork—Sectional view of the Sport-Vac highlighting the shape and position of the interior housing.

31. (No caption)

(Photo—the prototype to the left, with all parts stored with a second set of parts, including dust bags, arranged to the right)

32. (Text frame)

DESIGN FEATURES

1. HOUSING—COMPACT, DURABLE, LIGHTWEIGHT
2. MOTOR—SMALL, HIGH POWERED
3. IMPELLER—HIGH YIELD, LOW BATTERY DRAIN

(Photo—cut-away view of the Sport-Vac)

33. (No caption)

(Photo—a closer look at the cut-away view of the Sport-Vac. Arrows indicate the flow of air through the intake into the bag, past the wall of the bag and through the vents in the interior housing toward the impeller and then out the scroll vent at the rear).

34. For assistance in the preparation of this filmstrip, acknowledgement is made to:

CAR-VAC INDUSTRIES LTD., VANCOUVER, McINTOSH DESIGN ASSOCIATES, TORONTO, BRITISH COLUMBIA RESEARCH COUNCIL, VANCOUVER, ACCURATE MOULD CO. LTD., TORONTO, STERLING PLASTIC MANUFACTURING CO., LTD., TORONTO

35.

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36. THAT'S AN IDEA:

A Case Study in Design Innovation
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The above filmstrips available in single frame slide form.

Extra copies Filmstrip Manuals available through the Queen's Printer, Ottawa, Canada.

THE CARE OF FILMSTRIPS

A torn, scratched or blurred filmstrip is more of an exasperation than a help to a teacher. For this reason it is sensible to take a few simple precautions to keep filmstrips in good condition.

Filmstrips suffer most from careless handling, dust and grease. To avoid these, they should be handled by the edge with clean fingers, should be kept off the floor when re-rolling, and should be stored in their dust-proof containers.

Filmstrips should be inspected and cleaned regularly ; if a strip has become smeared by an oily machine it should be cleaned before storing. A soft cloth moistened with a film cleaner is best.

Damage to the sprocket holes of a filmstrip may occur in use. If, after careful threading, a strip should by accident jump from the sprockets, if should be re-threaded immediately.

Scratches can be avoided by using a clean machine. Those surfaces of the projector which are in contact with the film should be cleaned frequently to ensure that they are spotless.

When finished with a filmstrip, roll it end first, emulsion side out, and replace it in the proper container.

If from repeated use a filmstrip becomes dry and brittle, it should be hung where a little moisture may be absorbed. *Do not wet a filmstrip ;* hang it in a cool cupboard above a pan of water.

Filmstrips should at all times be stored away from radiators and other heat sources.

ROGER DUHAMEL, F.R.S.C., Queen's Printer and Controller of Stationery, Ott
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